LG EMPR

- Selection / Type designtion
- Ratings
- Operation & setting
- Pin type
- Screw type
- Tunnel type
- Appendix

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99 -12

ISO 14001, ISO 9001

Electronic Motor Protection Relay

EMPR

ELECTRONIC MOTOR PROTECTION RELAY

LG Industrial Systems

ELECTRONIC
MOTOR PROTECTION RELAY

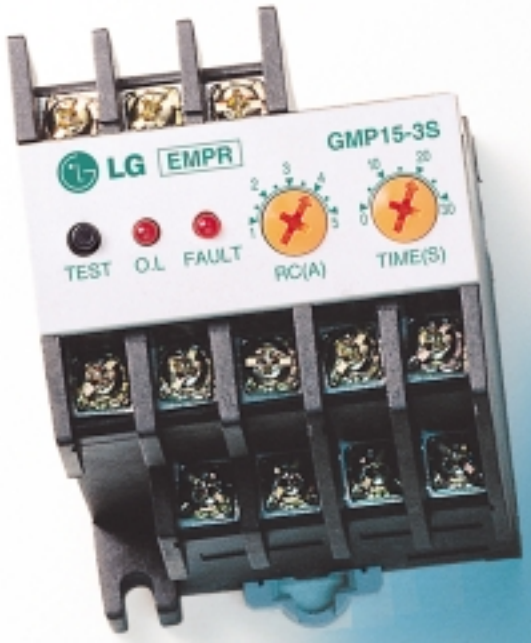
The EMPR (Electronic Motor Protection Relay) protects electric equipment such as 3phase motor against overload, phase failure, asymmetry, reverse phase etc

Pass the EMC test, safety test

Extensive current range
Current range: 0.2~80A

Test / Reset button
Simulation by the Test/Reset button

Visible indicator
Indicating the tripped situation by the LED



IEC 60947

- **Standard**: IEC 60947-1, IEC 60947-4-1, IEC 60947-5-1, UL 508, KSC4504
- **Certification & approval:** CE, UL / CSA, Lloyd register, Korea register, KS, ISO 14001, ISO 9001(Including proceedings)

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■Safety against electro-magnetic wave and surge

• EMC (Electro Magnetic Compatibility) test

- Adaptation test against the electro-magnetic wave

• Pass the EMC test by the TOKIN and onetech EMC lad site

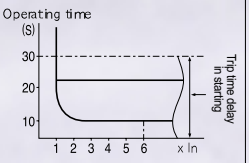
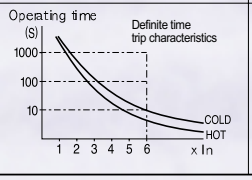
■ Adopting inverse-time trip characteristics (Note 1)

• Applicable to any motors by adjusting the operating time according to the motor starting characteristics

• Inverse-time trip characteristics curve is similar to that of the heat characteristics
in motors and is suitable to protect the motors

• The EMPR with inverse-time trip characteristics protect the motors more safely by combining 2 types of curves. Follow the cold curve when the motor is starting and then follow the hot curve after the setting time

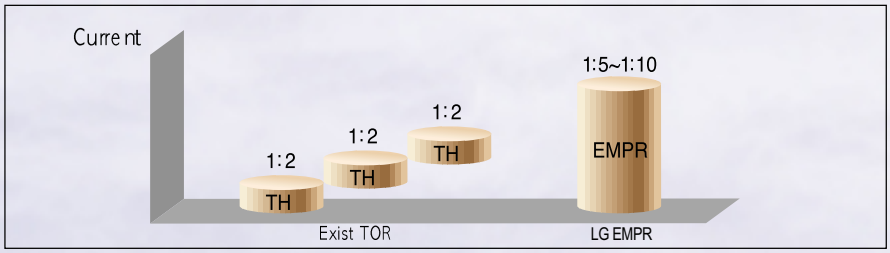
• In definite-time trip characteristics, delay the trip time in motor starting is available and is suitable for even load use

Type	Trip characteristics curve	Delay time in starting	Delay time in operation	Trip characteristics	Applied type	Note
Definite time		Needed	Needed	Constant	Tunnel type	Suitable for even load use
Inverse time		Needed		Inverse time (similar to heat characteristics of motor)	Screw, pin type	Cold curve Hot curve

■Wide ranges in the rated current

• Ranges between 0.2~80A is available without external CT

• Wide current range (Min.: Max. current setting ration is 1:5~1:10) provide more wider protection range compare with the thermal overload type relays



■ Isolated auxiliary contacts (1NO 1NC)

• Safely protects the circuit. (2NO state before power is applied)

• No additional aux. relay is needed for the sequence circuit

■ Ambient temperature

• -25~70℃ in operation / -50~80℃ in storage

■ Humidity

• 10~90% RH and 60% RH is recommended

Note1) For detailed of the inverse time characteristics, refer to page 18

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EMPR selection

■Type selection (I)

Rated current(A) (Adjustable)	220~240Vac			380~440Vac		
	3 phase motorFull load kW(HP)		current(A)	3 phase motor Full load kW(HP)		current(A)
0.2-1	~0.09	(~0.13)	0.8	~0.18	(~0.25)	0.7
1-5	0.12~0.75	(0.17~1)	4.8	0.25~1.5	(0.33~2)	4
3-15	0.37~2.2	(0.5~3)	11.1	1.5~4	(2~5.5)	9.4
4-20	0.55~3.7	(0.75~5)	17.4	1.5~7.5	(2~10)	17
7-35	1.5~7.5	(2~10)	34	3.7~11	(5~15)	24
16-80	3.7~18.5	(5~25)	79	5.5~37	(7.5~50)	74
0.5-6	0.09~0.75	(0.13~1)	4.8	0.09~1.5	(0.13~2)	4
3-30	0.37~5.5	(0.5~7.5)	26	1.1~11	(1.5~15)	24
5-60	1.1~11	(1~15)	48	2.2~22	(3~30)	46.5

■Type selection (II)

Type	Max. range (A)	Recommended range (A)	Note
GMP60T	0.5~6	1~5	Definite time
	3~30	5~25	
	5~60	10~50	
GMP15-2S, GMP15-3S GMP15-2P, GMP15-3P	0.2~1	0.2~1	Inverse time
	1~5	1~5	
	3~15	3~15	
GMP20-2S, GMP20-3S GMP20-2P, GMP20-3P	0.2~1	0.2~1	
	1~5	1~5	
	4~20	4~20	
GMP35-2S, GMP35-3S	7~35	7~35	
GMP80-2S, GMP80-3S	16~80	16~80	

note) 1. The above values are the recommended one and are AC3 class standard type 3phase squirrel cage motor use basis. The values may be vary according to the motor manufacturer
2. 3CT type EMPR is not available for 1phase motor use

Type designation

GMP **15** - **2** **S**

Model name
Global motor protection

Frame	Current setting	Type
15	0.2~1	Pin& Screw
	1~5	
	3~5	
20	0.2~1	
	1~5	
	4~20	
35	7~35	Screw
80	16~80	
60	0.5~6	Tunnel
	3~30	
	5~60	

No.	CT No.
2	2CT
3	3CT

No.	Type
S	Screw
P	Pin
T	Tunnel

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EMPR Ratings

EMPR							
Model		GMP-60T		GMP15-2P	GMP15-3P	GMP20-2P	GMP20-3P
Type		Tunnel type Pin type					
Mounting		Separate mounting		Direct mounting			
Operating time		Definite time		Inverse time			
CT No.		2		2	3	2	3
Protection	Overcurrent	●		●	●	●	●
	Asymmetry	—		—	●	—	●
	Phase failure	△(Note1)		○	●	○	●
	Reverse phase	—		—	●	—	●
Current setting range(A)		0.5~6	3~30 5~60	0.2~1	1~5 3~15	0.2~1	1~5 4~20
Applied motor (kW)	220~240V	0.09~0.75	0.37~5.5 1.1~11	~0.09	0.12~0.75 0.37~2.2	~0.09	0.12~0.75 0.55~3.7
	380~440V	0.09~1.5	1.1~11 2.2~22	~0.18	0.25~1.5 1.5~4	~0.18	0.25~1.5 1.5~7.5
Time setting (sec)	Starting time	0.2~30		—			
	Operating time	0.2~13		0~30 (Note3)			
	Reset type	Manual reset					
Operational power	Voltage	180~260V(110/440V) (Note4)		100~260Vac			
	Frequency	50/60Hz					
Aux. s/w	Contact	1NO+1NC		2NO (1NO 1NC after power applied)			
	Ratings	5A/250 Resistive load		3A/250 Resistive load			
	Operation	(95 ⊣ 96 Close)		(95 ⊣ 96 Close, 97 98 Open)			
Insulation resistance		Min 50 MΩ at 500Vdc					
Surge endurance		7kV (6 times for 1Min. interval)					
Impulse noise endurance		4kV (5Min)					
Ambient temperature	Operation	-25℃~70℃					
	Storage	-50℃~80℃					
Humidity		45~85RH					
Indicator		LED					
Mounting type		Screw or din rail(35mm)		Direct mount on the MC			
Applied MC	GMC series	GMC-9, 12 ,18, 22, 32, 40, 50		—		—	
	SMC series	SMC-10P,15P,20P,25P,35P,48P,50		SMC-10P, 15P		SMC-20P	
	CH series	CH-3, 3N, 5, 5N, 6N, 7.5N, 10N		CH-3, 3N		CH-5, 5N	
	Reference	17Page		13Page			

Note 1) Under phase failure, over current flows. And it is protected by the over current protection function
2) In 2CT EMPR, phase failure protection only for 2phase is available

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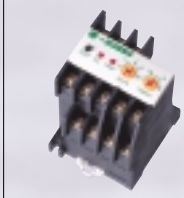
EMPR



Model		GMP15-2S	GMP15-3S	GMP20-2S	GMP20-3S	GMP35-2S	GMP35-3S	GMP80-2S	GMP80-3S
Type		Screw type							
Mounting		Separate mounting				Direct mounting & Separate mounting			
Operating time		Inverse time							
CT No.		2	3	2	3	2	3	2	3
Protection	Overcurrent	●	●	●	●	●	●	●	●
	Asymmetry	—	●	—	●	—	●	—	●
	Phase failure	○	●	○	●	○	●	○	●
	Reverse phase	—	●	—	●	—	●	—	●
Current setting range(A)		0.2~1	1~5	3~15	4~20		7~35		16~80
Applied motor (kW)	220~240V	~0.09	0.12~0.75	0.37~2.2	0.55~3.7		1.5~7.5		3.7~18.5
	380~440V	~0.18	0.25~1.5	1.5~4	1.5~7.5		3.7~11		5.5~37
Time setting (sec)	Starting time	—							
	Operating time	0~30 (Note3)							
	Reset type	Manual reset							
Operational power	Voltage	100~260Vac							
	Frequency	50/60Hz							
Aux. s/w	Contact	2NO (1NO 1NC after power applied)							
	Ratings	3A/250 Resistive load							
	Operation	(95 ⊣ 96Close, 97 98Open)							
Insulation resistance		Min 50 MΩ at 500Vdc							
Surge endurance		7kV (6 times for 1Min. interval)							
Impulse noise endurance		4kV (5Min)							
Ambient temperature	Operation	-25℃~70℃							
	Storage	-50℃~80℃							
Humidity		45~85RH							
Indicator		LED							
Mounting type		Screw or din rail(35mm)							
Applied MC	GMC series	GMC-9, 12		GMC-18		GMC-22, 32		GMC-40, 50, 65, 75, 85	
	SMC series	SMC-10P, 15P, 20P				SMC-25P, 35P		SMC-48P, 50P, 65P, 80P	
	CH series	CH-3, 3N, 5, 5N				CH-6N, 7.5N		CH-10N, 15N	
Reference		28Page							

Note 3) 600% of the rated current basis
4) Default is 220V. ( ) is optional

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Screw & pin type mounting

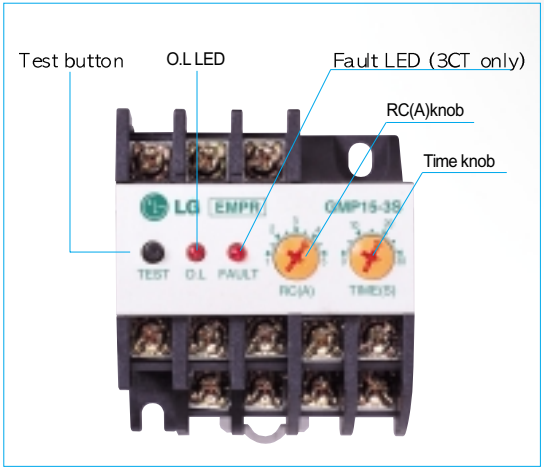
1. Check the test button operation

● Check if the EMPR operate when the over current flows

① Check if the wiring method is correct (Refer to the wiring diagram)

② Press the 'Test' button and then the 'O.L' LED, which indicates the overcurrent tripped condition, is turned on and the EMPR is tripped

③ When the 'Test' button is pressed under tripped condition, the 'O.L' LED is turned off and the EMPR is reset



2. Set the operating time (Inverse time characteristics)

● The operating time is indicated around 600% of the rated current on the operatin characteristics curve

① Set the operating time by considering the types of load (ex: If the starting current flows for 10 seconds. Set the time 110~120%, 11~12seconds)

② Operating time range is 0~30 seconds

③ If the staring time is set to 10sec, the EMPR is tripped at 10 seconds at 600% of the rated current But when the motor is in operation, the EMPR is tripped ony 1.3sec at 600% of rated current (refer to the COLD and HOT characteristics curve)

※ The operating time setting for phase failure and asymmetry is not adjustable because it is set when assembled

3. Set the operating current

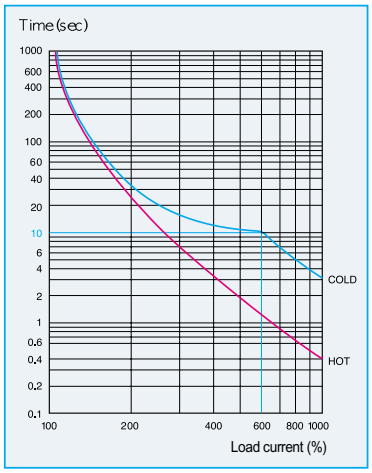
● Set the current by considering the rated current of a motor to protect the overcurrent

① Set the 'RC'knob to the maximum value and then starting the motor

② Under operating condition, rotate the 'RC'knob to the countclockwise until the 'O.L' LED turned on&off. The current at this point is the value (100%) under real load condition

③ Rotate the 'RC'knob to the clockwise until the 'O.L' LED turned off. In general case the setting is 110~120% of the rated current

(ex: When the 'O.L' LED glittings at 21A, the setting current will be 23A (=21*1.1))



• Inverse time characteristics curve

Note) 1. The EMPR with Inverse time characteristics may be tripped when restarting the motor for several times continuously
2. When the motor is frequently starting forwardly and backwardly, set the times a little longer
3. Please use the tunnel type EMPR for crane and hoist use

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4. Check the LED condition when operation

■ Protection

- 2CT : Over-current, phase failure (Partial)
- 3CT : Over-current, phase failure, Reverse phase, Asymmetry

① Over-current

- Set the rated current and operating time to protect the damage by the over-current
- When the over-current flows, the 'O.L' LED turned on&off. And when the EMPR is tripped by the over-current the 'O.L' LED (2CT protect only 2 phases) is turned on

② Phase failure

- The phase failure may be caused by the internal or external wiring problems. A motor may stop or continously rotate in phase failure. At this time high current flows through the rotator in the motor. The wire temperature will be increased and may provoke dielectric brakedown in coils and damages in contacts, consequently the motor burned
- When the motor do not rotate, the high current may be protected by the over-current protection. But when in the motor continuously rotate the Phase failure protection function is needed
- The EMPR protect the Phase failure in 3 seconds under 3 phase loads ('O.L'LED glittings)
  Phase failure in phase 'R' - 'FAULT' LED glittings 1 time for 3second interval
  Phase failure in phase 'S' - 'FAULT' LED glittings 2 times for 3second interval
  Phase failure in phase 'T' - 'FAULT' LED glittings 3 times for 3second interval

③ Asymmetry

- When there is 30~50% asymmetry between phases the 'Fault' LED is turned on&off. (When it is over 50%, it judge it as a phase failure and the 'O.L' LED is turned on&off and then tripped)

④ Reverse phase

- Tripped within 3 seconds and the 'O.L' LED and 'Falut' LED is turned on&off one after the other

■ LED operation

Condition			Red O.L LED	Red Fault LED	Note
Operation	Normal		Off	Off	
	Overcurrent		On & Off	Off	0.4 Second interval in operation
	Asymmetry (30~50%)		Off	On & Off	0.4 Second interva in operation
Trip	Over-current		On	Off	
	Phase failure (3CT)	R	On	On & Off	1 Times for 3second
		S	On	On & Off	2 Times for 3second
		T	On	On & Off	3 Times for 3second
	Phase failure(2CT)		On & Off	Protect 2phases of 3poles, trips within 3sec	
	Reverse phase(3CT)		On & Off	On & Off	One after the other

Tunnel type mounting

1. Check the Test/Reset button operation

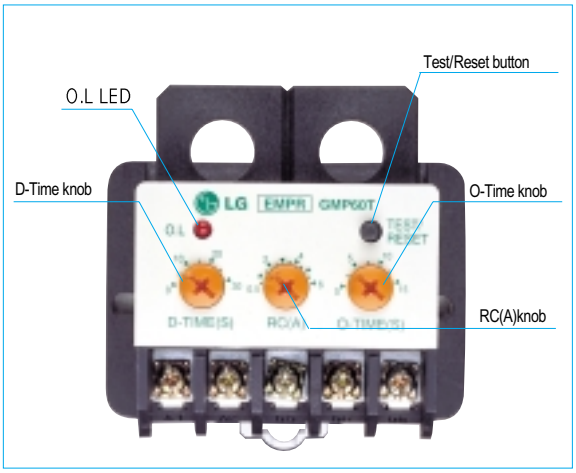
● Check if the EMPR operate in overcurrent

①Check if the wiring is correct
(Refer to the wiring diagram)

②Set the 'D-Time' and 'O-Time" knob tothe min. ratings

③When the 'Test' button is pressed under tripped condition, the 'O.L' LED is turned off

④When you press the 'Test' button again then the lamp turned off and the EMPR reset



Note) In operation, even though you press the 'Test/Reset' button, the EMPR do not trip

2. Set the operating time (Definite time characteristics)

●D-time (Delay time) : 0.2~30 sec

The motor starting current, which flows when the motor is starting, is generally 600~800% of the rated current and the delay time varies according to the load condition. It is the time during which the EMPR do not operated by over-current during the starting time

① Set the delay time by use of the 'D-time' knob

② In case you do not know the delay time, start the motor by setting the 'D-time' knob to the max. Position and after checking the time during which the staring current become stable, set the D-time
(In general pump, the setting time is 3~5 seconds)

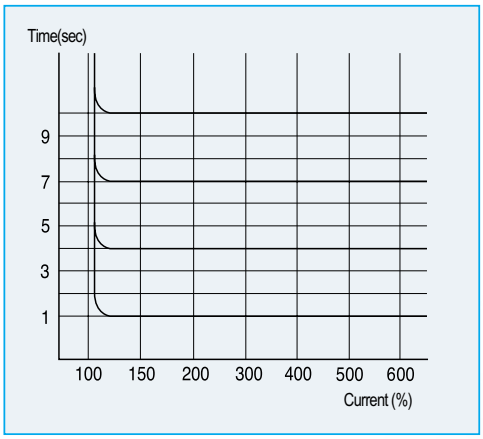
Note) The time delay is forced time delay type, therefore if you make a mistake to select the time, the motor may be burn

● The operating time is the time during which the EMPR tripped by the over-current. TheEMPR is tripped after the selected operation time

① Set the operation time by the 'O-time' knob

② In special case such as for mechanical shock relay, if you set the 'O-time' to the min value, the EMPR is tripped at once

Note) Generally set it to 4~6 seconds



•Definite time characferistics curve

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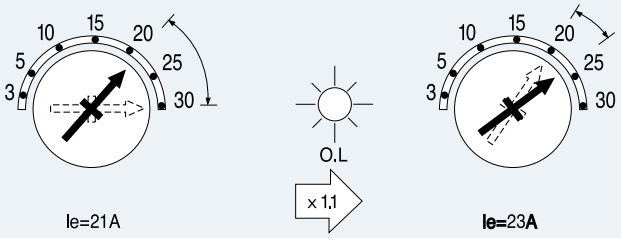
3. Set the operating current (Similar to that of pin type & screw type)

● Set the operation current to protect from over current. Set the current by considering the rated current

① Start the motor by setting the 'RC' knob to the maximum position

② Under operating condition, rotate the 'RC' knob to the countclockwise until the 'O.L' LED turned on&off. The current at this point is the value (100%) under real load condition

③ Rotate the 'RC' knob to the clock-wise until the 'O.L' LED turned off. In general case the setting is 110~120% of the rated current



Ie=21A Ie=23A

(ex: When the 'O.L' LED glittings at 21A, the setting current will be 23A (=21*1.1))

4. Check the LED condition when operation

① Over-current

- The EMPR is not tripped during the D-time under over-current but the O.L LED dimly turned on and off to indicate that the over-current flows
- If the EMPR tripped after D-time the O.L LED turned on brightly

Condition	Red O.L LED		Note
Operation normal		Off	
Overcurrent	On & Off		On & Off in over current
Trip over-current			On

② Phase failure

- If a motor does not rotate under phase failure, the high current may flows.

At this time a motor is protected by the over-current protection function

Pin type GMP-P

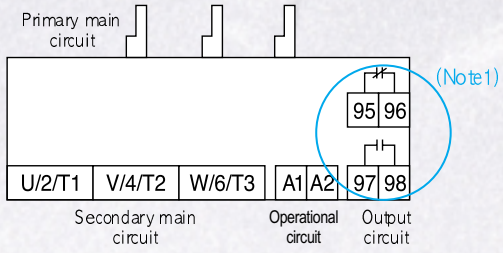
■ Characteristics

- 2CT, 3CT type
- Wide current setting range(Free voltage : 100~260V)
- Inverse-time trip characteristics curve is similar to that of the heat characteristics in a motor
- Strong against external effect from the noise

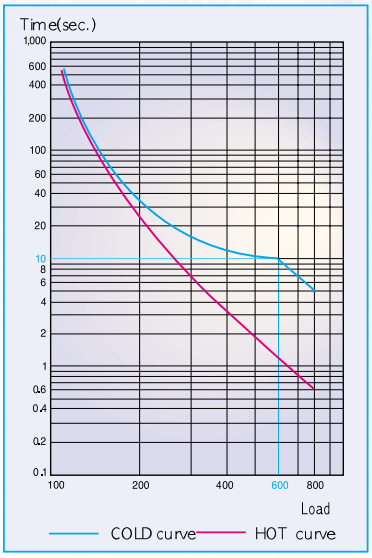
■ Protect function

- Over-current protection: Set the rated current and the operating times. Inverse-time characteristics
- Phase failure protection: Trips within 3 seconds
- Reverse phase protection: Trips within 3 seconds (In 3CT type)
- Indicating asymmetry failure (3CT type)

■ Contact configuration



■ Characteristics curve



■ Ratings (Pin type)

Type		GMP15-2P	GMP15-3P	GMP20-2P (Note2)	GMP20-3P
Operating time		Inverse time			
charateristics		2	3	2	3
CT No. Current setting range		0.2~1	0.2~1	0.2~1	0.2~1
		1~5	1~5	1~5	1~5
		3~15	3~15	4~20	4~20
Protection		●	●	●	●
	Overcurrent	—	●	—	●
	Asymmetry	○ (Note3)	●	○	●
	Phase	—	●	—	●
failure Time setting		0~30			
	Reverse	Manual reset			
phase Operation (sec)		100~260Vac			
	Operating	50/60Hz			
time		2NO (1NO 1NC after power applied)			
	Reset type	3A 250Vac resistive load			
	Voltage	(95 ┤├ 96close) (97 ┤├ 98open) (Note1)			
	Frequency	Direct mounting			
Aux. s/w	Contact	SMC-10P, SMC-15P		SMC-20P	
	Ratings	CH-3, CH-3N		CH-5, CH-5N	

Note 1) Before power applied : 2NC ┤├(95 96open, 97 98open)
After power applied : 1NO 1NC (95 96 close, 97 98open)
Tripped conditon : (95 ┤├ 96open, 97 98close)
2) In 2CT EMPR, phase failure protection only for 2phase is available

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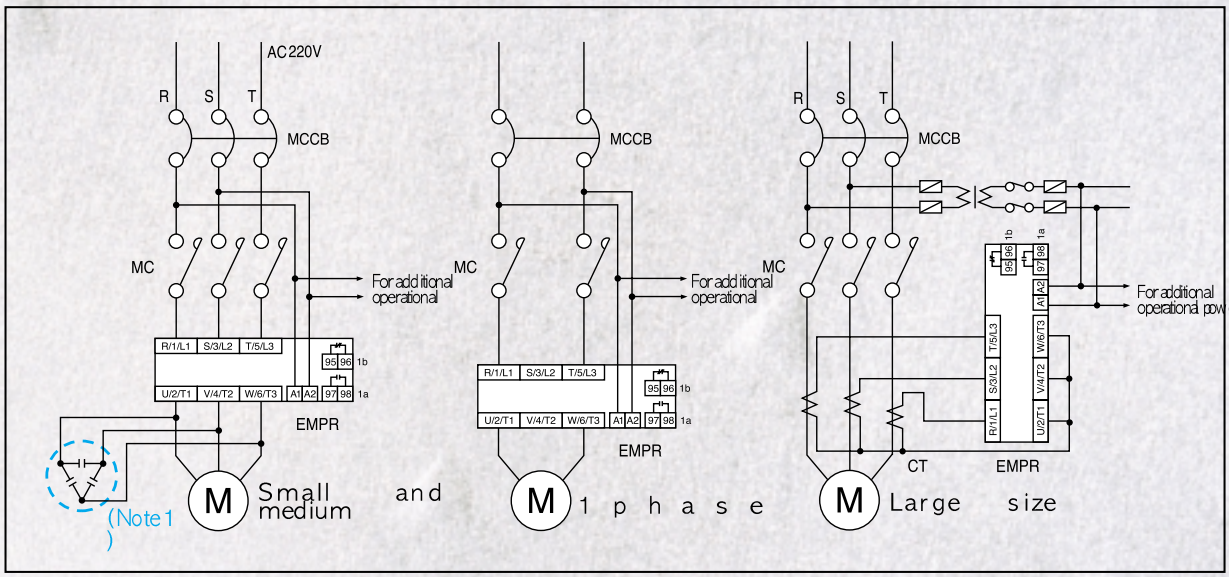
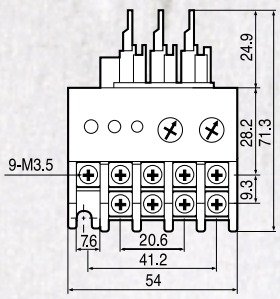
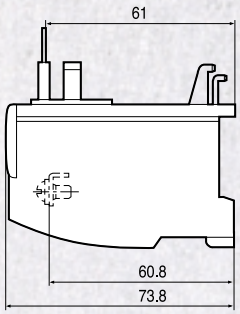
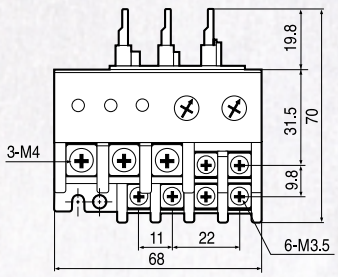
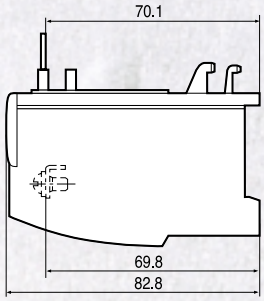
■ Wiring method



Note 1) Phase lead condenser may be installed line side. But it is more effective when it is installed near the motor in the load side
2) 3CT type EMPR is not available for 1phase motor use

■ External dimensions

Type	Dimensions(mm)	Weight(kg)
GMP15-2P	 	0.14
GMP15-3P		0.15
GMP20-2P	 	0.18
GMP20-3P		0.18

Screw type GMP-S

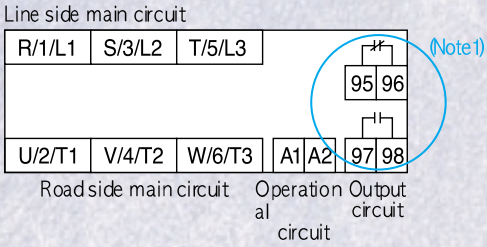
■ Characteristics

- Separate or direct mounting
- Screw dr din-rail mounting type
- 2CT, 3CT type
- Wide voltage range (Free voltage : 100~260V)
- Inverse time characteristics(Similar to heat characteristics in a motor)
- Strong against external effect from the noise

■ Protection

- Over-current protection: Set the rated current and the operating times. Inverse-time characteristics
- Phase failure protection: Trips within 3 seconds
- Reverse phase protection: Trips within 3 seconds (In 3CT type)
- Indicating asymmetry failure (3CT type)

■ Contact configuration



■ Ratings (Screw type)

TYPE		GMP15-2S	GMP15-3S	GMP20-2S	GMP20-3S	GMP35-2S	GMP35-3S	GMP80-2S	GMP80-3S
Operating time charateristics		Inverse time							
CT No.		2	3	2	3	2	3	2	3
Current setting range		0.2~1	0.2~1	0.2~1	0.2~1	7~35	7~35	16~80	16~80
		1~5	1~5	1~5	1~5				
		3~15	3~15	4~20	4~2				
Protection	Overcurrent	●	●	●	●	●	●	●	●
	Asymmetry	—	●	—	●	—	●	—	●
	Phase failure	○(Note2)	●	○	●	○	●	○	●
	Reverse phase	—	●	—	●	—	●	—	●
Time setting (sec)	Operating time	0~30							
	Reset type	Manual reset							
Operation (sec)	Voltage	100~260Vac							
	Frequency	50/60Hz							
Output relay	Contact	2NO (1NO 1NC after power applied)							
	Ratings	3A 250Vac resistive load							
	Operation	95 ⫫ 96close 97 ⫞⫟ 98open (Note1)							
Mounting type		Screw or din-rail mounting type							
Applied MC	GMC series	GMC-9, 12		GMC-18		GMC-22, 32		GMC-40, 50, 65, 75, 85	
	SMC series	SMC-10P, 15P		SMC-20P		SMC-25P, 35P		SMC-48P, 50, 65P, 80P	
	CH series	CH-3, 3N		CH-5, 5N		CH-6N, 7.5N		CH-10N, CH-15N	

Note 1) Before power applied : 2NO (95 ⫞⫟ 96open, 97 ⫞⫟ 98open)
After power applied : 1NO 1NC (95 ⫫ 96close, 97 ⫞⫟ 98open)
Tripped conditon : (95 ⫞⫟ 96open, 97 ⫫ 98close)
2) In 2CT EMPR, phase failure protection only for 2phase is available

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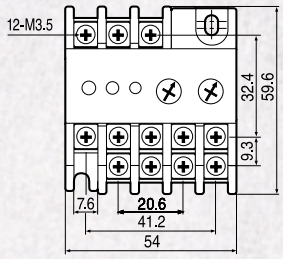
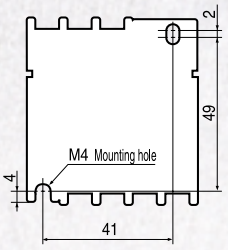
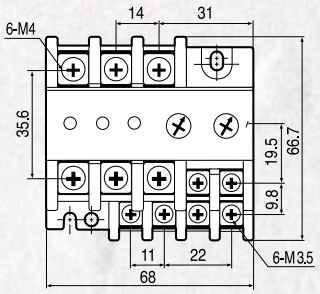
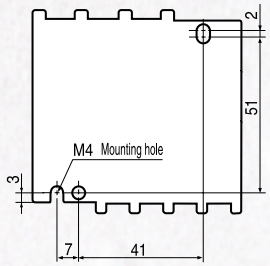
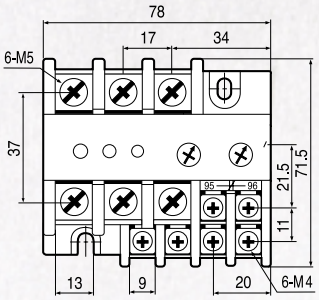
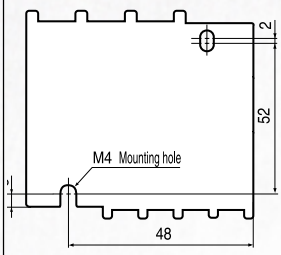
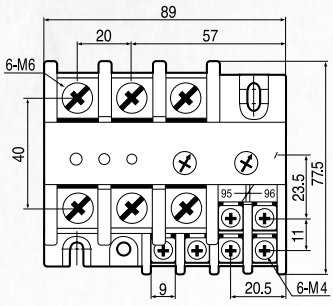
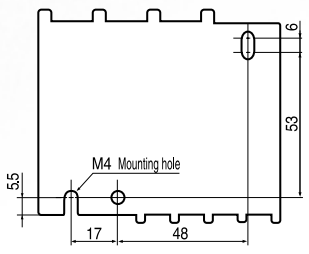
■ Characteristics curve and wiring (Same with the pin type EMPR)

■ External dimensions

Type	Dimensions(mm)	Mounting dimensions(mm)	Weight(kg)
GMP15-2S			0.14
GMP15-3S			0.15
GMP20-2S			0.20
GMP20-3S			0.21
GMP35-2S			0.26
GMP35-3S			0.27
GMP80-2S			0.42
GMP80-3S			0.46

E M P R Tunnel type GMP-T

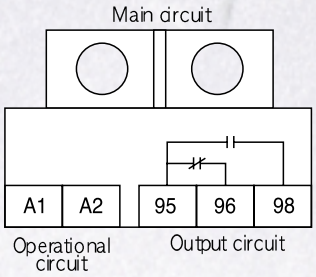
■ Characteristics

- Small size, economical
- Delay time setting in starting and operation
- Over current, phase failure protection
- Definite time characteristics
- Wide current setting range
- Screw or din-rail mounting

■ Protection

- Over current: Trips the over current after setting time
- Phase failure: Under phase failure condition over current flows
  The EMPR tripped if it is over the setting over-current

■ Contact configuration



■ Tunnel type EMPR protects the current under 0.1A

- The tunnel type EMPR with 0.5~ 6A nominal current, can detect the current under 0.1A
  If we increase the number of times of a wire pass through the CT (Tunnel), the EMPR can detect the lower current

No. of times to pass through	Current setting range
1	0.5~6
2	0.25~3
3	0.17~2
4	0.12~1.5

■ Ratings (Tunnel type)

TYPE		GMP60T
Operating time charateristics		Definite time
CT No.		2
Current setting range		0.5~6
		3~30
		5~60
Protection	Over current	○
	Asymmetry	—
	Phase failure	△ (Note1)
	Reverse phase	—
Time setting (sec)	Starting time	0.2~30
	Operating time	0.2~15
	Reset time	Manual reset
Operational power	Voltage	180~ 260V (110V / 440V) (Note2)
	Frequency	50 / 60Hz
Output relay	Contact	1SPDT (1c)
	Ratings	5A 250Vac resistive load
	Operation	95 ┼┼ 96close, 95 ┼├ 98 open
Mounting type		Screw or din-rail mounting type

Note 1) Under phase failure condition over current flows.
The EMPR tripped if it is over the setting over current
2) ( ) are optional specifications

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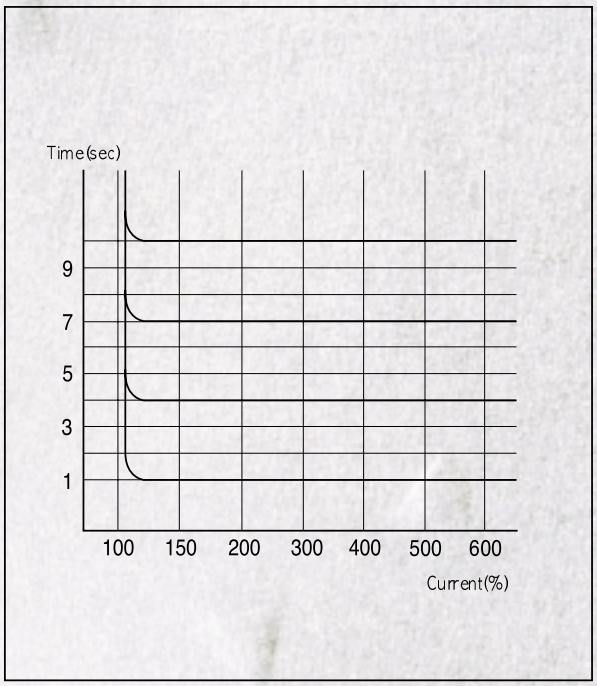
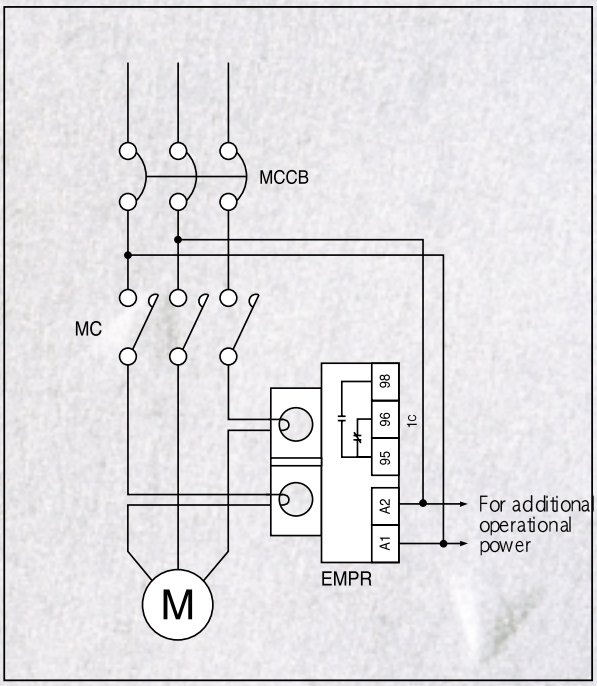
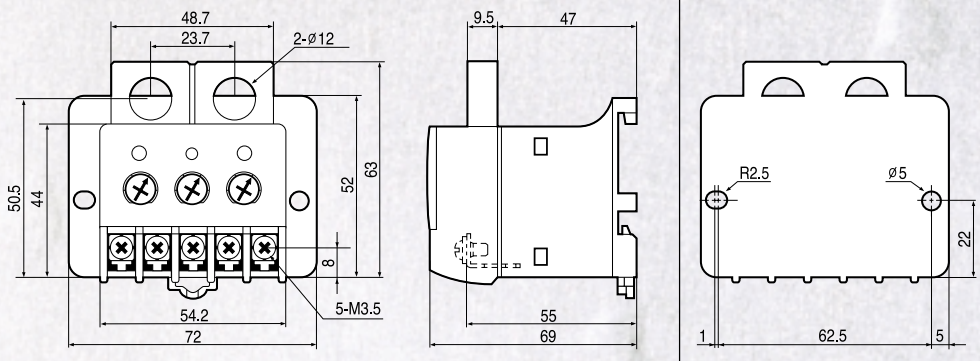
■ Characteristics curve



■ Wiring method



■ External dimensions

Type	Dimensions(mm)	Mounting dimensions(mm)	Weight(kg)
GMP60T			0.14

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Comparison between inverse time characteristics and definite time characteristics

1.Definition

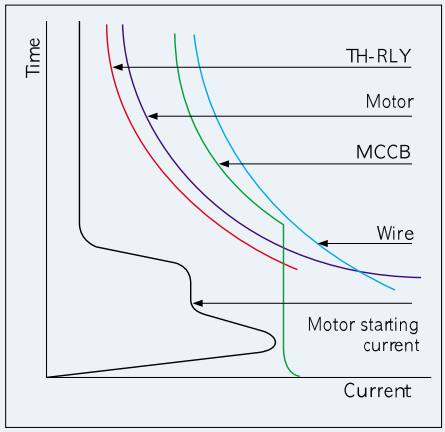
- Inverse time characteristics EMPR: The tripping time is different depending on a flowing current, if the current is higher than the setting current is flowed
- Definite time characteristics EMPR: No matter how high current flows, if it is over the setting current, the EMPR tripped at the same setting time

2.Considerations to select the EMPR

EMPR is normally used in the industrial sites to protect motors. You are apt to overlook this but you are needed to check the similarities between the characteristics curve of a motor and the EMPR characteristics curve. The heat characteristic curve of a motor is similar to that of the copper's, because the main component of the rotor and stator in motor is copper. Wires in motors as well as the wires in MCC or switch gear or for various industrial use have the similar characteristics curve with that of motor's

Therefore the EMPR has the similar characteristics curve with that of the motor's and wire's in order to efficiently protect them from damage. The MCCB also have similar characteristics curve with that of motor's, and when we consider the coordination,the EMPR also have the similar characteristics curve with the MCCB too

The EMPR with definite time characteristics are much used for protecting motors, because for it is easy to set the current and time, but if you need more safe and complete protection of the motors and for protecting the high performance motors, it is needed to use the EMPR with inverse time characteristics because it has more similar characteristics with that of the motor's



3.Comparing the definite time and inverse time characteristics

Clause / Type	Over current trip	Operational characteristics curve	Short circuit trip under operation	Recommended load
Definife time characteristics	Constant (Setting time)	Straight line (Parallel with the current axis)	Apply the trip time in general case	Loads with constant impedance (Heater, electronic circuit, light etc)
Inverse time characteristics	Varies according to the current	Similar to the heat characteristics curve	The shortest trip time	Motor

4.Classify the EMPR as to its usage

- Definite time EMPR: Loads with the starting current and the operating current are almost same.....heater, lighting, electronic circuit
- Inverse time EMPR: Loads with inverse time heat characteristics.....motor, etc

5.Characteristics curve

- There are two types of curves in the inverse time characteristics of a EMPR

–Cold curve (Starting)
When the motor starting it follows the cold curve. The starting current go up to 6~8 times of the operating current (In motors, the starting current go up to 600~800% of the rated current)

–Hot curve (Operating)
When the motor operating, it follow the hot curve. The curve is similar to that of the general motor and set the threshold protection curves close to the critical temperature of the motor and therefore effectively protect the motors

–The characteristics curve of the EMPR follows the COLD curve when starting and then the HOT curve when operating.
i.e.) If the starting time is set to 10sec. The motor tripped after 10sec. At 600% of the rated current according to the cold curve, but when the motor is in operation, the motor is tripped only after 1.3sec. If the 600% of the rated current flows through the EMPR

Caution) 1. The EMPR may be tripped when the motor is re-starting several times. In this case set the tripping time a little longer
2. Select the tunnel type EMPR for crane or hoist use

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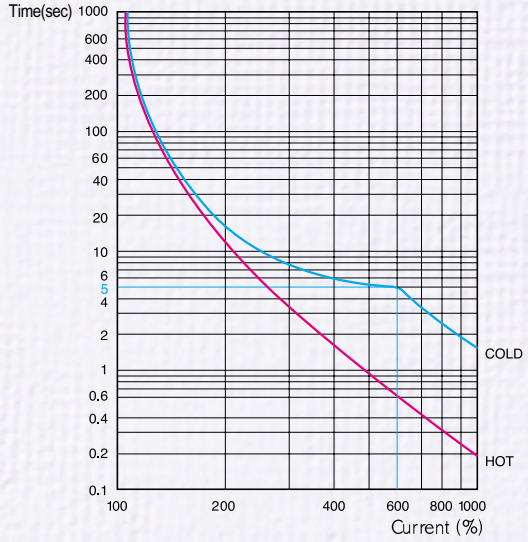
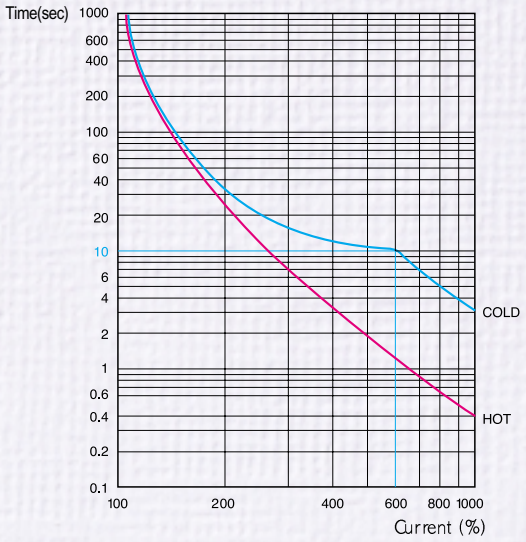
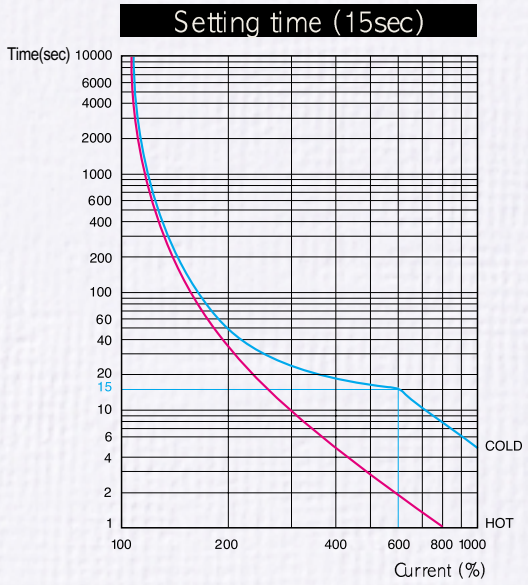
Setting time (5sec)



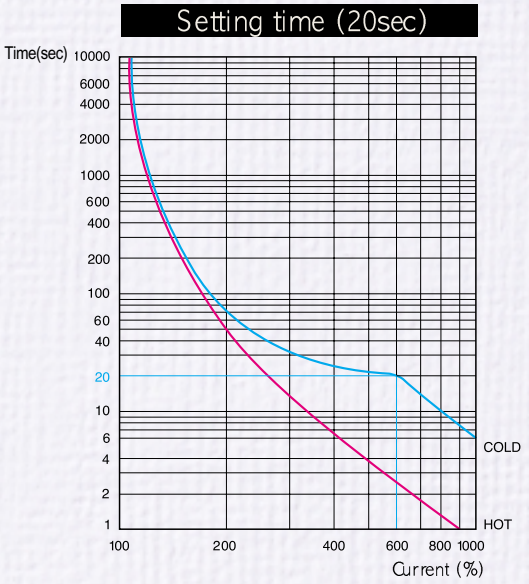
Setting time (10sec)



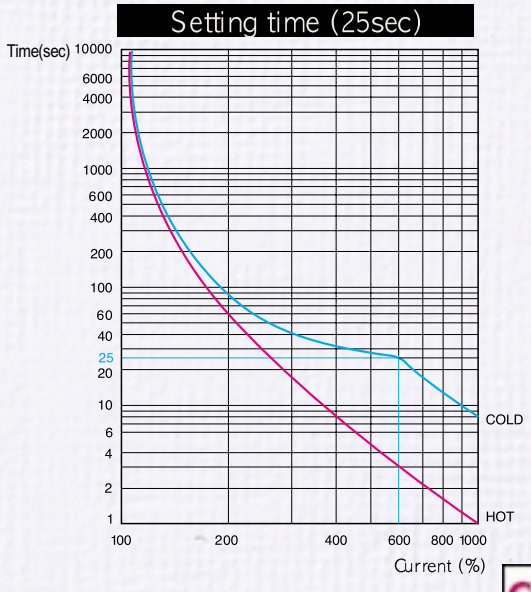
Setting time (15sec)



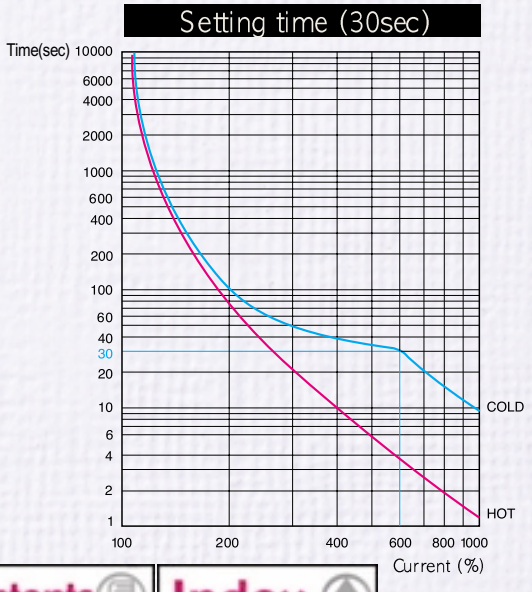
Setting time (20sec)



Setting time (25sec)



Setting time (30sec)



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EMPR-99.9901/Dec. 1999 Printed in Korea STAFF